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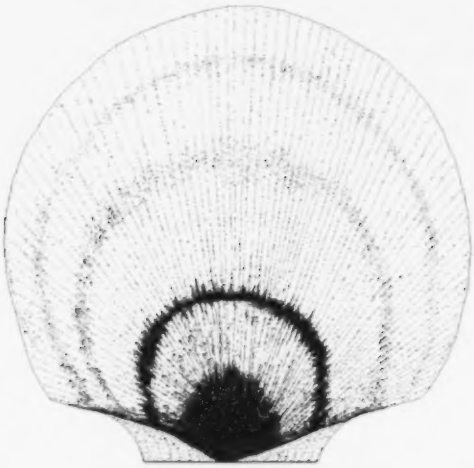
Maritimes Region
Canadian Science Advisory Secretariat
Science Advisory Report 2012/029

ASSESSMENT OF SCALLOPS (*PLACOPECTEN MAGELLANICUS*) IN SCALLOP FISHING AREA (SFA) 29 WEST OF LONGITUDE 65°30'W



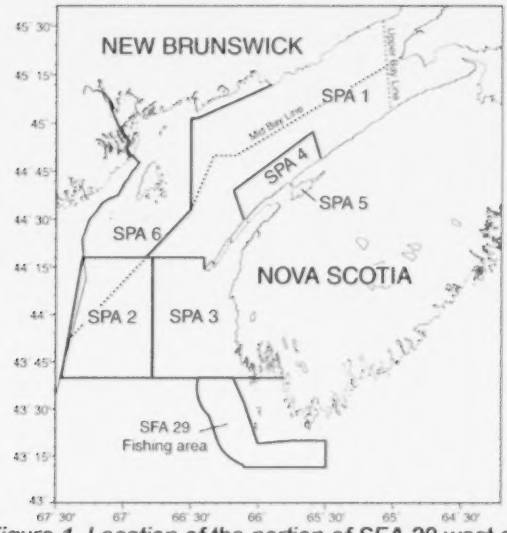


Figure 1. Location of the portion of SFA 29 west of longitude 65°30'W. Refer to full detail map in Appendix 1 for place names.

Context

Scallop Fishing Area (SFA) 29 encompasses a very large inshore area inside the 12-mile territorial sea, from the south of Yarmouth (latitude 43°40'N) to Cape North in Cape Breton. This report refers to only that portion of SFA 29 west of longitude 65°30'W continuing north to SPA 3 at latitude 43°40'N (Figure 1), hereafter referred to as SFA 29 West.

Prior to 1986, the Full Bay Scallop Fleet fished in this area. Following the 1986 inshore/offshore scallop fishing agreement, fishing by the Full Bay Fleet was restricted to north of latitude 43°40'N. A limited fishery by the Full Bay Fleet was granted from 1996–98. Access was again granted to this fleet in 2001 with a full at-sea monitoring program and with a condition of a post-season industry-funded survey. SFA 29 West is within Lobster Fishing Area (LFA) 34 and, as a result, scallop fishers consulted with lobster fishers in the area to deal with potential conflicts. Lobster and by-catch of other species continue to be monitored in this fishery.

In 2002, Fisheries and Oceans approved access to this area by the Full Bay Fleet and inshore East of Baccaro licence holders who are eligible to fish in SFA 29 West. SFA 29 inshore scallop licenses were historically restricted to East of Baccaro (east of longitude 65°30'W). A joint project agreement was signed with the fishing fleets, Natural Resources Canada, and Fisheries and Oceans Canada, with all parties providing funds to conduct multi-beam acoustic mapping of the seafloor and other scientific work. A map showing bottom features for the entire area has been prepared and was distributed to the fishermen for the 2004 fishery. Work continues on analyzing surficial geology and the spatial distribution of scallops.

Advice on Total Allowable Catch (TAC) for this area is based on survey estimates of abundance and commercial catch rates. There are no reference points for the fishery in SFA 29 West at this time.

This Science Advisory Report is from the March 26, 2012, Assessment of SFA 29 West of 65°30' Scallop. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SUMMARY

- This scallop fishery has taken place in the portion of Scallop Fishing Area (SFA) 29 west of longitude 65°30' W since 2001 and is currently conducted by two fleets: the Full Bay Fleet and a limited number of inshore East of Baccaro licence holders.

- As of 2010, the TAC and landings are reported as totals by subarea for both fleets combined. In 2010, a total of 198.2 t was landed against the Total Allowable Catch (TAC) of 200 t. In 2011, a total of 194.1 t was landed against the TAC of 200 t.

- The fishery in subareas A and E has been sporadic over time, and commercial catch rates in these areas have generally decreased since 2009. In subarea B, commercial catch rates for both the Full Bay and East of Baccaro fleets declined from 2009 to 2010 by 30%. From 2010 to 2011, catch rates increased by 12% for the Full Bay fleet; however, catch rates decreased by 6% for the East of Baccaro fleet. In subarea C, from 2009 to 2011, catch rates decrease by 32% and 21% for the Full Bay and East of Baccaro fleets, respectively. Catch rates in subarea D declined by 16% for both fleets between 2009 and 2011.

- All survey abundance indices show a general declining trend since the fishery began in 2001 (2004 in subarea D). Recruitment is presently low in all subareas.

- Somatic growth rates between the 2010 and 2011 surveys were lower than predicted in all subareas and were at or below zero in subareas C and D.

- Two methods were used to estimate exploitation rates in SFA 29 West: one from commercial catch rates (depletion model approach), representing more localized conditions, and one from the research survey (biomass dynamics model approach), which represents broader conditions. Trends in annual total fishing effort were also presented since effort is directly related to fishing mortality. Results from all three time series were generally consistent. Levels of exploitation in 2011 appeared to result in the removal of all surplus production and possibly caused biomass declines in subareas B and D.

- Advice on expected impacts for the 2012 fishery was based on exploitation levels relative to the harvest strategy in 2011. This is a status quo exploitation strategy, and catch would have to be reduced to allow for population biomass growth. Given current levels of recruitment and observed growth rates, a biomass increase for 2012 may not occur even if the fishery were closed.

- In subarea A, exploitation rates from the research survey and annual total fishing effort indicate increasing exploitation in 2010 and 2011. Landings of 18.1 t in 2012 are expected to result in no change in exploitation levels compared to 2011.

- In subarea B, the effort series and survey model estimates indicate that exploitation increased in 2010 and 2011; whereas, the depletion model showed a sharp increase in exploitation in 2010 and a decrease in 2011. Landings of 59.3 t in 2012 are expected to result in a modest decrease in exploitation.

- In subarea C, both the effort and depletion series indicates that there has been a slight decline in exploitation in 2010 and 2011; whereas, the survey series shows an increase from 2010 to 2011. Landings of 45.5 t in 2012 are expected to result in a modest decrease in exploitation.

- In subarea D, the effort series indicates that there has been a slight decline in exploitation in 2010 and 2011, the survey series shows an increase from 2010 to 2011, and the depletion series shows very little change from 2010 to 2011. Landings of 68.9 t are expected to result in a large increase in exploitation. A reduction in landings to 48 t is expected to keep the effort and exploitation in 2012 the same as in 2011.

- Discards of lobster by the SFA 29 West scallop fishery in 2011 were estimated at less than 0.1% of the weight of lobsters landed by the Lobster Fishing Area 34 lobster fleet in 2010/2011 in the area corresponding to SFA 29 West. All lobsters caught in the scallop fishery were released back into the water, the majority of which were estimated to be alive and uninjured.

BACKGROUND

Rationale for Assessment

As part of the Regional Science Advisory Process, a meeting was held on March 26, 2012, at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia to review the 2010 and 2011 scallop fishery and assess the status of the scallop stock in SFA 29 West in support of the management of the 2012 fishery. Specifically, the meeting was called to provide science advice for the SFA 29 West scallop fishery by subarea using analyses of catch rate and survey biomass trends. In addition, an assessment of the lobster bycatch was also provided.

ASSESSMENT

Fishery

This scallop fishery has taken place in the portion of SFA 29 west of longitude 65°30'W since 2001. The Full Bay (FB) scallop fleet was the sole participant in 2001. Starting in 2002, the total allowable catch (TAC) was shared between the FB fleet and a limited number of inshore East of Baccaro (EoB) licence holders who are eligible to fish in SFA 29 West. As of 2010, the TAC and landings are reported as totals by subarea for both fleets combined. In 2010, a total of 198.2 t was landed against the TAC of 200 t, and in 2011, a total of 194.1 t was landed against the TAC of 200 t (Table 1; Figure 2).

Table 1. Scallop landings (meats, t) and TACs for SFA 29 West in 2010 and 2011. Table includes Food, Social, and Ceremonial (FSC) catch, which is added to the total landings but does not count against the TAC.

		Fleets Combined		*First Nations*	
Year	Subarea	TAC (t)	Landings (t)	FSC	Total Landings (t)
2010	A / E	25.0	9.4 / 5.4	< 0.1	14.8
	B	65.0	50.7	0.3	51.0
	C	45.0	60.6		60.6
	D	65.0	72.1	4.7	76.8
	Total	200.0	198.2	5.0	203.2
2011	A / E	25.0	18.1/ 5.6		23.7
	B	65.0	59.3		59.3
	C	45.0	45.5		45.5
	D	65.0	65.7	3.2	68.9
	Total	200.0	194.1	3.2	197.3

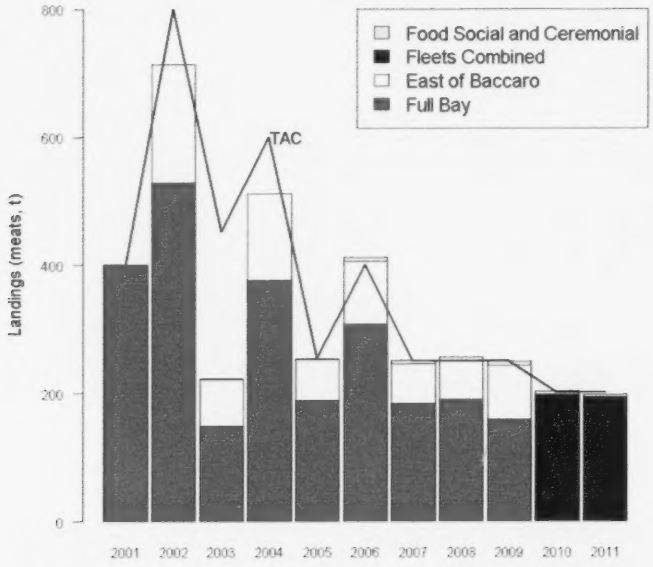


Figure 2. Scallop landings (meats, t) by fleet, which count against the TAC, landings for Food, Social, and Ceremonial purposes, which do not count against the TAC, and total TAC for SFA 29 West.

The scallop fishery in SFA 29 West occurred into 5 subareas (A-E, Appendix 1). All subareas opened for the 2010 fishing season on June 14. The TAC was overrun in subarea C by 15.6 t (35%; closed July 11) and in subarea D by 7.1 t (11%; closed June 29). The TAC was not reached in subareas A/E or B, and these subareas closed on August 31. In 2011, all subareas opened on June 20. There were small overruns in subarea C (0.5 t, 1%; closed July 25) and D (0.7 t, 1%; July 4). The TAC was not reached in subareas A/E or B, and these subareas closed on August 31. There were no closed areas in either 2010 or 2011 as a result of lobster bycatch.

The fishery in subareas A and E has been sporadic over time, and commercial catch rates in these areas have generally decreased since 2009 (Figure 3). In subarea B, commercial catch rates for both the FB and EoB fleets declined from 2009 to 2010 by 30%. From 2010 to 2011, catch rates increased by 12% for the FB fleet; however, catch rates decreased by 6% for the EoB fleet (Figure 3). In subarea C, catch rates have been declining since 2007 for the FB fleet

and since 2008 for the EoB fleet. From 2009 to 2011, catch rates decreased by 32% and 21% for the FB and EoB fleets, respectively. Catch rates in subarea D have continued to decline since 2005 and declined by 16% for both fleets between 2009 and 2011.

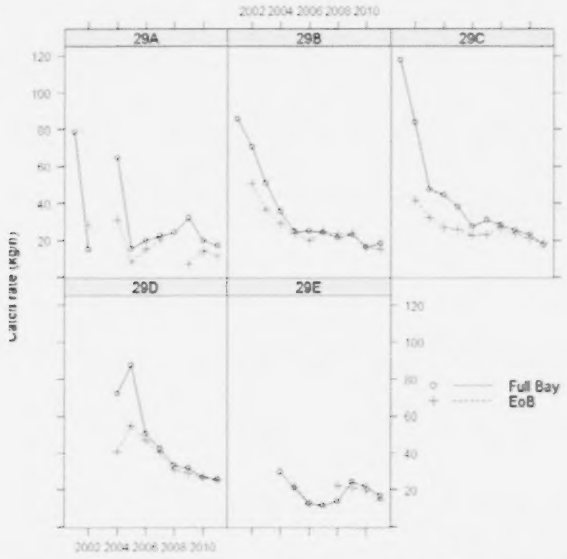


Figure 3. Annual trends in average commercial catch rate (kg/h) for the SFA 29 West scallop fishery for each subarea by fleet.

Survey

A post-season joint industry/departmental research survey has been conducted annually since 2001 when the current fishery started. The survey design was initially a simple random design over the whole area. From 2002 to 2004, a stratified random design was used with strata defined by the management subareas A to E. Starting in 2005, strata were defined by bottom type as identified by geologists as part of the joint industry/government multibeam mapping project conducted in this area. A new interpretation of the bottom types was made available in 2008 and was used to design the surveys for 2008 through 2011. Survey estimates from 2001 to 2007 have been modified to correspond to this new design. Subarea E has not been consistently covered in the survey due to time limitations; this subarea is considered to be marginal habitat for scallops and, as a result, has been less of a survey priority.

Time trends for the abundance of commercial size scallops (≥100 mm shell height) and recruits (90-99 mm shell height) are plotted in Figure 4. All survey abundance indices show a general declining trend since the fishery began in 2001 (2004 for subarea D). Recruitment is presently low in all subareas.

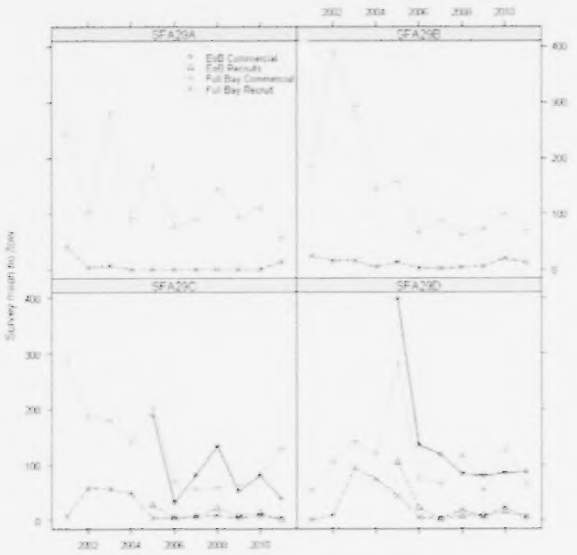


Figure 4. Annual trends in estimated mean number per tow of fully recruited (≥100 mm) and recruit (90-99 mm) size classes from research surveys by subarea in SFA 29 West. Full Bay commercial and recruit series estimated from F/V Julie Ann Joan (2001-2003, 2005-2011) and F/V Branntelle (2004) tows. East of Baccaro commercial and recruit series estimated from F/V Overton Bay (2005) and F/V Faith Alone (2006-2011). Geophysical strata used for design.

Subarea A saw the largest decrease in commercial size scallops from 2010 (110.7 per tow) to 2011 (56.9 per tow), and the mean number per tow is at the lowest point in the time series for that subarea. Mean number per tow of commercial size scallops also decreased in subarea B, but it is still at a level comparable to those observed since 2006. In subarea C, both surveys showed a sharp decrease in commercial size scallops between 2005 and 2006. Since 2006, the FB survey indicated a relatively stable abundance with increases in 2010 and 2011, whereas the EoB survey index has been variable and most recently shows a decline for 2011. In subarea D, a similar decrease in abundance occurred for commercial size animals between 2005 and 2006. The FB survey index indicates that the commercial abundance has remained relatively stable since 2008, while the EoB survey index has fluctuated both above and below the FB index. Recruitment continues to be low in all subareas (Figure 4).

An analysis of meat weight, shell height, and age data collected during the survey allowed for annual variation to be taken into account when calculating somatic growth of commercial size scallops. Condition factor, which refers to the relationship between shell height and meat weight, varies annually potentially due to environmental conditions. Declining condition factors observed since 2009 resulted in lower somatic growth rates than would be anticipated based on the average age of the commercial stock. Somatic growth rates between the 2010 and 2011 surveys were lower than predicted in all subareas and were at or below zero in subareas C and D.

Exploitation Rate Estimates

Two methods were used to estimate exploitation rates in SFA 29 West: one from commercial catch rates (depletion model approach), representing more localized conditions, and one from the research survey (biomass dynamics model approach), which represents broader conditions.

Trends in annual total fishing effort were also presented since effort is directly related to fishing mortality. Results from all three time series were generally consistent (Figure 5). Both fishing effort and the survey estimates are expected to reflect area-wide impacts of the fishery, while the depletion method could reflect more local impacts in terms of the area actually being fished.

The fishery in subarea A has been sporadic over time and, for some years, was only fished for a few days resulting in limited fishery data from which to construct depletion estimates. This lack of data produced results with a very high degree of uncertainty as well as concerns over the accuracy of the estimates; therefore, the results were not presented. However, exploitation rates from the research survey and annual total fishing effort indicate increasing exploitation in 2010 and 2011 (Figure 5). In subarea B, the effort series and survey model estimates indicate that exploitation increased in 2010 and 2011; whereas, the depletion model showed a sharp increase in exploitation in 2010 and a decrease in 2011 (Figure 5). The high exploitation estimate from the depletion model in 2010 may be the result of localized fishing in that year. In subarea C, both the effort and depletion series indicate that there has been a slight decline in exploitation in 2010 and 2011; whereas, the survey series shows an increase from 2010 to 2011. In subarea D, the effort series indicates that there has been a slight decline in exploitation in 2010 and 2011, the survey series shows an increase from 2010 to 2011, and the depletion series shows very little change from 2010 to 2011.

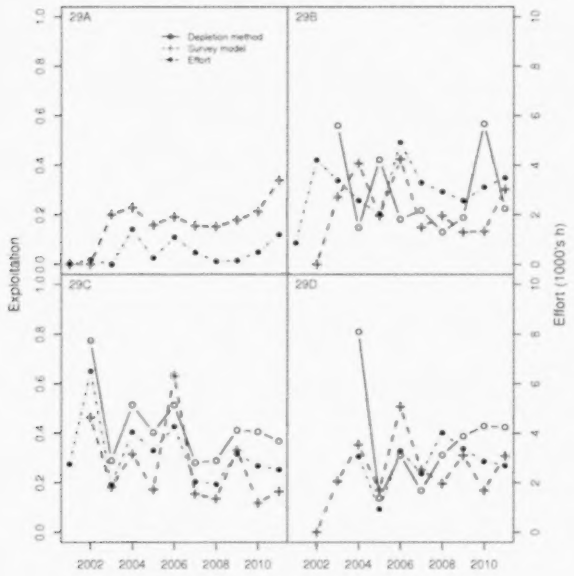


Figure 5. Comparison of exploitation estimates from the depletion method, survey biomass model, and the total annual fishing effort for commercial size scallops in SFA 29 West, subareas A, B, C, and D. Note that reliable estimates of exploitation for subarea A were not obtained from the depletion method.

Lobster Considerations

An assessment of lobster discards in the SFA 29 West scallop survey and the fishery was presented. Further information on bycatch for the SFA 29 West fishery, including non-lobster species, can be found in Sameoto and Glass (2012).

In subarea A, the mean number of lobster per tow in the scallop survey was 2.9 in 2010 and 2.4 in 2011. In subarea B, there was a mean of 4.4 lobsters per tow in 2010 and 2.3 lobsters per tow in 2011. In subarea C, a mean of 1.9 and 0.5 lobsters per tow was observed as part of the FB survey in 2010 and 2011, respectively, while a mean of 3.0 and 4.3 lobsters per tow was observed for the EoB survey in 2010 and 2011, respectively. The mean number of lobsters per tow in subarea D was 0.2 and 0 for the FB survey in 2010 and 2011, respectively, and 1.0 and 0.7 lobsters per tow for the EoB survey in 2010 and 2011, respectively (Figure 6).

The level of observer coverage has been variable over the history of this fishery. The requirement is one observed day per active vessel, which was met in 2010 and 2011.

As in previous years, most lobsters caught during observed fishing trips were in subarea B, though in 2010 the majority of lobsters observed in the EoB fleet were in subarea C (Figures 6). The majority of lobsters observed were between 65 and 105 mm carapace length (CL) for both 2010 and 2011. There were no closed areas due to high lobster bycatch in either 2010 or 2011.

Discards of lobster by the SFA 29 West scallop fishery in 2011 were estimated at less than 0.1% of the weight of lobsters landed by the Lobster Fishing Area (LFA) 34 lobster fleet in 2010/2011 in the area corresponding to SFA 29 West. All lobsters caught in the scallop fishery were released back into the water, the majority of which were estimated to be alive and uninjured. The combined estimates for the two fleets in 2011 were 8,872 caught; of those, 3,024 were dead or injured. The total weight of the captured lobsters in 2011 was approximately 4.4 t (8,872 lobsters, with an assumed average size of 85 mm CL and average weight of 0.5 kg).

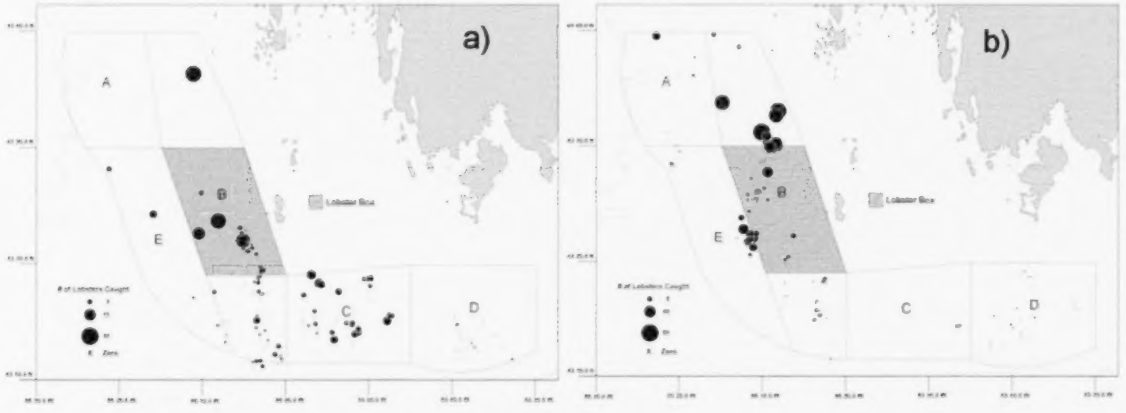


Figure 6. Location and number of lobsters caught in SFA 29 West in 2010 (a) and 2011 (b) from observed scallop fishing trips. Crosses indicate locations where no lobsters were captured. The lobster box, where fishing on and after August 1 required an observer, is indicated by the coloured polygon.

Sources Of Uncertainty

The assumptions required for the depletion model analysis of no recruitment, natural mortality, equal vulnerability of commercial size scallops to the fishing gear, and minimal growth during the fishing season have not been verified.

Exploitation rate estimates from the biomass dynamics model assume that survey biomass is proportional to population biomass.

Advice on expected impacts of the 2012 fishery is based on the assumption that somatic growth in 2012 will be similar to that observed in 2011. Somatic growth rates in 2012 are difficult to predict due to high annual variability.

CONCLUSION AND ADVICE

All of the information presented indicates that biomasses in subareas A, B, C, and D are at their lowest levels since this fishery started in 2001. Overall, commercial catch rates have been declining for at least the last three years. Current productivity in terms of somatic growth and recruitment is low; recruitment is expected to continue to be low in the near future. Levels of exploitation in 2011 appeared to result in the removal of all surplus production and possibly caused biomass declines in subareas B and D. Although the survey model has shown no change in biomass in subarea C since 2006, the surveys trends were conflicting for 2011, and catch rates have declined in this subarea since 2008.

Advice on expected impacts for the 2012 fishery was based on exploitation levels relative to the harvest strategy in 2011. The 2012 effort levels expected to achieve the same catch as in 2011 were determined using the predicted catch rates for 2012. These 2012 effort levels were then compared to those of 2011. The 2011 catch rate for subarea A was used instead of the 2012 prediction because of the low correlation between catch rate and biomass ($p=0.28$). If catches in 2012 are the same as in 2011, landings of 18.1 t, 59.3 t, and 45.5 t in subareas A, B, and C, respectively, are expected to result in either no change (0% in A) or modest decreases (7% in B, 13% in C) in effort (and exploitation). The same catch from subarea D in 2012 as in 2011 (68.9 t) is expected to result in a large increase (44%) in effort (and exploitation). As mentioned previously, these exploitation rates may result in a continued decline in biomass in subareas B and D, with no increase in subarea C.

The degree of change in effort for subareas A, B, and C suggests that there will be little change in exploitation levels if the catches in 2012 are set to be the same as in 2011, assuming conditions remain similar to 2011. However, a reduction of the catch to 48 t would be needed for subarea D to keep the effort and exploitation in 2012 the same as in 2011. This is a status quo exploitation strategy, and catch would have to be reduced to allow for population biomass growth. Given current levels of recruitment and observed growth rates, a biomass increase for 2012 may not occur even if the fishery were closed.

Subarea	2011 Catch (t)	2011 Effort (h)	2012 Effort (h) for 2011 Catch Levels	Percent Change in Effort
A	18.1	1,201.2	1,201.2	0.0
B	59.3	3,491.5	3,257.0	-6.7
C	45.5	2,531.6	2,206.1	-12.9
D	68.9	2,699.8	3,882.3	43.8
Total	**191.8**	**9,924.1**	**10,546.6**	

SOURCES OF INFORMATION

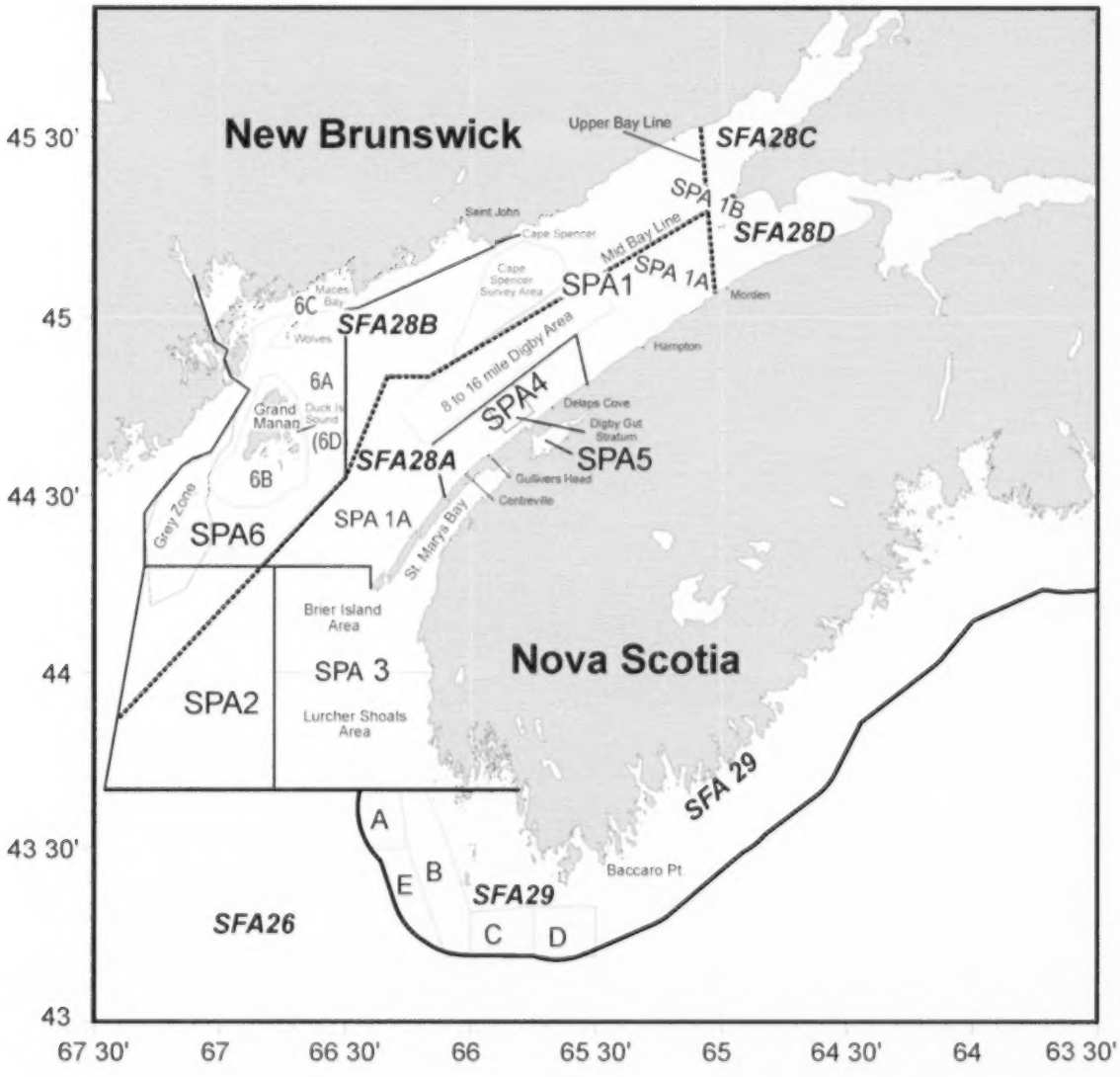
This Science Advisory Report is from the March 26, 2012, Assessment of SFA 29 West of 65°30' Scallop. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

Sameoto, J.A., and Glass, A. 2012. An Overview of Discards from the Canadian Inshore Scallop Fishery in SFA 28 and SFA 29 West for 2002 to 2009. Can. Tech. Rep. Fish. Aquat. Sci. 2979: vi + 39 p.

Sameoto, J.A., Smith, S.J., Hubley, B., Pezzack, D., Denton, C., Nasmith, L., and Glass, A. 2012. Scallop Fishing Area 29: Stock status and update for 2012. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/042.

APPENDICES

Appendix 1. Locations and place names for inshore scallop grounds.



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